

of two strips of platinum blackened at the front surface and carrying a thermo-junction at the back. One of these is exposed to the radiation to be measured, while an electric current passes through the other. This electric current is regulated until the two thermojunctions are at the same temperature. The intensity of the current necessary for this purpose gives a measure of the radiation after certain corrections have been applied. The use of the instrument is simple and convenient, and found so much favour with observers well qualified to judge that the International Union of Solar Research recommended it as a standard for measurement of solar radiation.

Since then the instrument has shown itself liable to certain systematic errors which render further experimental investigations necessary. Its intrinsic merit is, however, so great that it is pretty certain that it will re-establish its reputation, but it is much to be regretted that Prof. Ångström's experimental skill is no longer available for the purpose. When the International Union of Solar Research made its recommendation, it was well aware that for a complete determination of the solar constant it is necessary to divide the spectrum into portions sufficiently homogeneous to allow the application of Lambert's law, but such complete determinations need only be carried out in one or two places. Abbot is doing excellent work, and if this be repeated at another station, say in India, the ground will be pretty well covered. In addition to these standards, we require, however, some instrument which is easily transported, and serves to record the radiations received at different times and in different localities. Ångström's pyrheliometer promises to serve that purpose admirably, as soon as more ready means have been found to standardise it easily from time to time, or to obtain a more permanent absorbing surface of the platinum strips. The coloured glasses which Ångström recently used to absorb parts of the spectrum chiefly affecting the absorption of aqueous vapour or carbonic acid will probably increase considerably the utility of the instrument.

It remains to notice an important contribution of Ångström's in the field of radio-activity. He measured, by means of a Bunsen ice calorimeter, the heat set free in a given time by radium salts, and found it to be constant and independent of the substance in which the radium is placed.

Ångström's charming personality endeared him to all with whom he came into contact, and we condole with Swedish science and the University of Upsala in the loss they have sustained. ARTHUR SCHUSTER.

NOTES.

We notice with great regret the announcement of the death of Prof. Alexander Agassiz, on Monday, at seventy-four years of age.

SIR JAMES DEWAR, F.R.S., has recently received two foreign diplomas, namely, that of Doctor, *honoris causa*, of the University of Brussels, and that of honorary member of the American Chemical Society.

THE Oceanographical Museum at Monaco, established by the Prince of Monaco, was opened on Tuesday by the Prince in the presence of representatives of European Governments and scientific societies. An article upon the museum and the opening ceremony will appear in a later issue of NATURE.

THE third International Physiotherapeutic Congress was opened by President Fallières on Tuesday at the School of Medicine, Paris. A large number of members of the

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French Government and of the Diplomatic Corps in Paris, including the British and American Ambassadors, were present at the ceremony.

THE council of the South African Association for the Advancement of Science at a recent meeting resolved by a unanimous vote to offer the presidency of the forthcoming meeting in Cape Town to Dr. T. Muir, C.M.G., F.R.S., and he has accepted the invitation to occupy that office. The actual date of the meeting has not yet been fixed.

LORD KINNAIRD will preside at the dinner to Sir John Murray on Tuesday next, April 5, in connection with the Michael Sars expedition for the exploration of North Atlantic waters. The dinner will be held at the Criterion Restaurant, and tickets may be obtained from the honorary secretary of the Atlantic Union, 13A Cockspur Street, S.W.

AT a meeting of the National Geographic Society at Washington on March 26, President Taft presented the gold medal of the society to Sir Ernest Shackleton, and in doing so he remarked:—"It is evidence of the society's high appreciation of the marvellous work you have done in the cause of science, of the endurance, courage and intelligence you have shown in the pursuit of a definite object." On March 28 the explorer was presented with the Cullum gold medal of the American Geographical Society, New York.

ON March 23 the Mayor of Doncaster, Councillor Halmshaw, formally opened a municipal museum at Doncaster, for which purpose some of the rooms in a fine mansion, known as Beechfield, have been set apart. These are devoted to specimens illustrating local geology, archaeology, and natural history. Mr. T. Sheppard, of Hull, who a short time ago was asked by the Doncaster Corporation to report on the lines the museum should take, was called upon by the Mayor to give an address. In this he dwelt more particularly upon the educational advantages of museums, and the necessity of provincial museums being of local interest. Subsequently the visitors were conducted round the collections, which reflected great credit upon the curator, Dr. Corbett.

ON Tuesday next, April 5, Dr. A. Harden will begin a course of three lectures at the Royal Institution on "The Modern Development of the Problem of Alcoholic Fermentation"; on Thursday, April 7, Dr. T. G. Longstaff will give the first of three lectures on "The Himalayan Region"; and on Saturday, April 9, Mr. W. W. Starmer will commence a course of three lectures on "Bells, Carillons and Chimes" (with musical illustrations). The Friday evening discourse on April 8 will be delivered by Prof. Percival Lowell, on "Lowell Observatory Photographs of the Planets"; on April 15 by Prof. W. J. Pope, on "The Chemical Significance of Crystal Structure"; and on April 22 by Mr. T. Thorne Baker, on "The Telegraphy of Photographs, Wireless and by Wire."

AFTER a number of slight earthquake shocks, an active eruption of Mount Etna commenced on March 23. Signor Ricco, the director of the observatory there, reported in a telegram from Nicolosi, a suburb of Belpasso, that the lava was advancing on March 24 in a stream more than 1500 feet wide, at a rate of upwards of 60 feet an hour. On March 25 he reported that the violence of the eruption had increased notably during the night, and that quantities of scoriae were being thrown up, accompanied

by great explosions and rumbling. Five new craters on the south declivity of the mountain, in the same place as those of former eruptions, have been reported. Though on this day the lava stream was larger, it was descending more slowly. The *Times* Rome correspondent reported that on March 27 the activity of the eruption had diminished considerably, and that the lava streams had ceased to flow. The lava appears on this occasion to have flowed farther than in the eruption of 1892. There was renewed activity in the craters on March 28, and a fresh descent of lava, though in more moderate quantities. As yet there is no real anxiety for the safety of Nicolosi or Borello.

THE Reale Istituto Lombardo has awarded the following prizes:—the mathematical prize for an essay on theory of transformation groups is awarded to Prof. Ugo Amaldi, of Modena, for his essay on the determination of all the infinite continuous groups of analytic point transformations in three-dimensional space; the Cagnola prize, relating to miasma and contagion, is awarded to Prof. Aldo Castellani, of the hospital for tropical diseases at Colombo (Ceylon). From the Brambilla foundation for industrial prizes, awards have been made to Elia Bianchi, for his system of constructing dwelling houses formed of hollow concrete blocks, and to Renaldo Rossi, for whole-meal and anti-diabetes bread. The Fossati prize is awarded to Prof. Giuseppe Sterzi, of Padua, for his two published volumes on the central nervous system of vertebrates.

PROF. J. W. H. TRAIL, F.R.S., recently offered to the council of the Linnean Society a sum of money for the purpose of encouraging the study of protoplasm by means of an award to be made periodically. This generous offer has been gratefully accepted, and a special medal has been struck in bronze for presentation with the award, bearing on the obverse a portrait of Linnæus and on the reverse the words "Trail Award" and the name of the recipient in a wreath. It is proposed to make an award about once in every five years for original work bearing directly or indirectly upon the "physical basis of life," and, in accordance with the wishes of the donor, a wide interpretation will be given to the scope of the investigations. The first recipient of the award will be Prof. E. A. Minchin, professor of protozoology in the University of London, whose researches on sponges and protozoa have done so much to advance our knowledge of protoplasmic structures, and who is also the translator of Prof. Bütschli's well-known work on protoplasm.

THE February Bulletin of the Société d'Encouragement pour l'Industrie nationale contains the president's address delivered by M. Bertin at the general meeting in January last, and particulars concerning the award of prizes and medals on the same occasion. We notice that a grand gold medal was awarded to Sir Robert Hadfield, F.R.S. M. L. Baclé, representing the association's committee of chemical arts, points out that Sir Robert Hadfield has at least thirty-one memoirs to his credit extending over the period 1888 to 1909, and that these have been presented to various learned societies in England and America. Among the numerous other awards, we notice that the Lavoisier medal was awarded to M. le Comte de Chardonnet, for the creation of a new industry—that of artificial silks—and that the first award of the recently established Michel Perret medal for scientific workers, who by their researches have contributed to the progress of industrial chemistry, was made to MM. Gall and de Montlaur, for their electrochemical work.

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THE New Zealand Survey Department is undertaking, in conjunction with the Marine Department, an inquiry into the tides of New Zealand. Hitherto the tide-tables for New Zealand in the New Zealand "Nautical Almanac" have been supplied by the U.S. Coast and Geodetic Survey, there having been no facilities in New Zealand for the necessary work. We learn from the *New Zealand Times* that the New Zealand Government has been invited by the Secretary of State for the Colonies to supply particulars as to the tides for insertion in the British Admiralty manuals for the use of the Navy and mercantile marine. It is hoped that the results from New Zealand, Australia, and other parts of the Pacific will lead to the thorough investigation of the tides of the Pacific Ocean, of which the available information is at present meagre. The latest scientific apparatus is being obtained from England, and the work has been placed in charge of Mr. C. E. Adams, secretary of the New Zealand Surveyors' Board, and is to be carried on actively at once.

IN the year 1891 Prof. Flinders Petrie found a curious mummy in a plundered tomb (supposed—though there is no positive proof—to have been that of a certain Ranefer or Ranofir) in the neighbourhood of the Medium Pyramid of King Snefru (*circa* 2900 B.C.). The fact that this was the oldest known mummy was duly recognised at the time, not only by its discoverer, but also by Prof. Maspero (see "The Dawn of Civilisation," p. 362), and with due care it was transported to England and lodged in the Museum of the Royal College of Surgeons. The significance of this mummy was not fully realised at the time, because it was generally supposed that the practice of embalming was as old as the history of Egypt, and many museums contained so-called "mummies" almost, if not quite, as ancient; and the importance attached to it seemed to diminish during the following decade, when some archæologists began describing earlier, even pre-dynastic, "mummies" (see "Guide to the First and Second Egyptian Rooms," British Museum). When, however, it was discovered (see *Cairo Scientific Journal*, May, 1908, p. 205) that there were no genuine mummies in the Cairo Museum (or in the British Museum) earlier than the time of the New Empire (*circa* 1580 B.C.), and that the bodies embalmed in the times of the tenth dynasty (*circa* 2200 B.C.) and twelfth dynasty (*circa* 2000 B.C.), found in 1907 by Mr. Quibell and Messrs. Lythgoe and Mace, respectively, were so fragile that they could not be moved without becoming reduced to mere bones and powder, the importance of the Medium mummy was more than rehabilitated, as was pointed out in NATURE in 1908 (vol. lxxviii., p. 342). The age of a mummy such as this was always open to question, seeing that it was found in a plundered tomb; but the important researches carried on by Dr. George A. Reisner at the Giza Pyramids during the last few years have now supplied the data which, when applied to the curious distinctive features of the Medium mummy, fix its age definitely at the period of the fifth dynasty (*circa* 2700 B.C.). Thus the specimen in the Royal College of Surgeons is of the utmost importance to the student of the history of embalming in Egypt, for it is more than 1100 years older than any *actual* mummy exhibited in any other museum, and 500 years older than any other mummy ever found.

MR. C. PEABODY has reprinted from the Putnam anniversary volume a valuable paper on certain quests and doles. He deals first with the rite of Hogmanay practised throughout western Europe, from the Isle of Man to France, in the period extending from late Advent to January. He connects it with a pre-Christian solstitial ceremony prevailing throughout northern and western

Europe. The English Waits fall into the same class. The French Dimanche des Brandons is connected by its fire rites with the ancient Pagan ceremonies at the vernal equinox. The paper is remarkable for a very elaborate collection of references to English and Continental folklore.

INFANTILISM and idiocy, and gigantism and idiocy, are the subjects of two papers by Dr. A. Marie in the *Bulletin et Mémoires de la Soc. Anth. de Paris* (5th Sér.), x., pp. 101, 113. He gives a classification of the various forms of dwarfing (nanism and infantilism). He believes that the nanism of the degenerate is nothing else than the permanence of an infantile stage through which all normal persons pass. One may consider the unprofitable age (*l'âge ingrat*) of transition between infancy and the final sprouting of growth at puberty as a kind of transitory normal acromegaly. Gigantism is only the acromegaly of infancy, the unprofitable age prolonged. Giants as well as dwarfs occur in families of degenerates.

THE Touareg, who have been exhibited at Paris, have been investigated by Dr. Atgier (*Bull. et Mém. de la Soc. Anth. de Paris*, 5th Sér., p. 222). The individuals studied were extremely limited in number, and necessarily belonged to the servile classes, as the upper-class Touareg would be too proud to exhibit themselves; consequently they represent a mixed group. On this slender foundation the following results have been arrived at. Excluding the Semitic element (Arabs, Jews, &c.) and the negro element (which is evident in those investigated), one finds the same ethnic groups as those which have peopled Europe—Indo-Europeans or Aryas—that is to say, blonds, brown brachycephals, and brown dolichocephals. Thus the expression "Berber" does not denote a race or variety of the human race, but a conventional term simply signifying those peoples of North Africa who are neither Semitic nor Negroid. According to Dr. Atgier, North Africa, like Europe, has Iberian, Celtic, Basque, and Kymric types, to which the term Aryas of Africa may be applied.

WE have received from the publishers (Bowes and Bowes, Cambridge) a copy of a lecture recently delivered by Mr. W. C. D. Whetham, F.R.S., in Trinity College, entitled "Eugenics and Unemployment." From his book on "The Family and the Nation," the lecturer cites evidence "that, with a few exceptions, the successful families in all classes are voluntarily restricting the number of their children, that their birth-rate has halved since 1876, and that the average number of children to the fertile marriage is now about three. About four children to the fertile marriage is the least number that will maintain a population unchanged. . . . But the population of the country as a whole is still expanding. Hence it follows that the unsuccessful families must still be multiplying rapidly. . . . We . . . are breeding fastest from our less efficient or definitely diseased strains." Having reached this conclusion, the lecturer begs his audience to dismiss any preconceptions and prejudices they may have as to pauperism and unemployment, and to look with him at the facts. He shows a curve based on the annual percentage of the unemployed members of trade unions, but points out that it "is roughly coincident with the cycles of good and bad trade," and "bears very little relation to the curve of general pauperism" or to "the total amount of distress in the country." He shows next how the curve based on the average number of paupers relieved per 1000 of the English and Welsh population has been declining "with natural fluctuations" from 1851 onwards. Since 1900 "there has been a slight increase,

so slight that it is difficult to be sure that it is more than a temporary fluctuation on a curve which shows yearly changes." Despite this warning, Mr. Whetham subsequently suggests that "our failure to go on diminishing pauperism of late years may be due to a slight lowering of the average character and efficiency value of our population," arising from an artificial reduction of birth-rate among "the thrifty, the prudent and the far-seeing, quite as much as by the selfish and pleasure-loving."

EVIDENCE is steadily accumulating to show that most of the forest mammals formerly supposed to be restricted to the west coast of Africa extend eastwards into Uganda. The latest instance of this is afforded by the lemuroid pottos, of which Mr. O. Thomas described an East African species of the genus *Perodicticus* at a recent meeting of the Zoological Society. Sir H. H. Johnston had long since announced the existence of a Uganda potto, but no specimen was forthcoming.

IN No. 4 of the first volume of the *Queensland Naturalist* Mr. G. F. Bennett relates some of his early experiences in hunting and observing monotremes. On one occasion, after digging out the burrow for a distance of about 20 feet, he came upon a nest containing two young duckbills, probably about a month old, each rolled up into a ball with the tail lying flat on the beak. In other instances the tail covered the head, and the beak rested on the stomach. All young ones of about a month old are plump with a greyish, bare skin.

AT the close of an article on the courtship of spiders, contributed by Prof. T. H. Montgomery, jun., to the March number of the *American Naturalist*, it is argued that Dr. Wallace's theory that the generally less conspicuous colour of female birds (as compared with their partners) is due to their need for greater protection will hold good also in the case of the Arachnida. "For the males do not develop their ornamentation until maturity, and they have much less need of protection than the females because they live usually not much longer than a few weeks after maturing, and take no part in the care of the young. The males have fulfilled their main function after impregnating the females, and they are of no use to the species thereafter. But the females live at least several months after maturing, in some cases several years, and they have the whole charge of the eggs and young."

THE March number of *Naturen* opens with an obituary, illustrated by a portrait, of Hans Christian Printz, Norway's oldest savant, who was born on April 13, 1817, and died, from an attack of influenza, on January 15 of this year in the ninety-third year of his age. On completing his education, Prof. Printz devoted much of his time to botany, and in 1864 made an important collecting tour; but about 1870 his attention was largely directed to meteorology, to which science he devoted much of his time in subsequent years. In addition to this, he was an enthusiastic egg-collector, and at one time possessed between 4000 and 5000 specimens, mainly, it would appear, Scandinavian, among which his greatest treasure was an egg of *Garrulus infaustus*. About 1871 this collection was acquired by the Bergen Museum.

THE nature and arrangement of the bony armour of the dinosaur Stegosaurus are discussed by Dr. R. S. Lull in the March issue of the *American Journal of Science*. In the specimen restored by Marsh a number of small ossicles were found adhering to the under surface of the lower jaw, and these, in the opinion of Dr. Lull, not only formed a singular shield, but also extended over a considerable part

of the body, as it is unreasonable to suppose that any portion of the skin of an armoured reptile would be unprotected. As regards the great vertical dorsal plates and caudal spines, the former of which Marsh regarded as forming a single series, it is practically certain that all were arranged in a double row. The vertical plates are considered to be nothing more than an ultra-development of the longitudinal vertical ridge on the horizontal scute of a crocodile or an unspecialised dinosaur like *Ancylosaurus*. Throughout the back the ribs are T-shaped in section in order to bear the weight of the plates. In the neck the latter are borne on short and notched transverse processes, but in the back these processes become longer and stouter, while in the sacral and anterior caudal region the bases of the plates are approximated and supported on the summits of the tall and expanded neural spines. On the other hand, the terminal third of the tail apparently formed a flexible aggressive weapon, in which the laterally divergent spines were inserted in the muscles between the neural spine and the centrum. Although the caudal spines of the English Kimeridgian *Omosaurus* or *Dacentrus* are structurally identical with those of one of the American species of *Stegosaurus*, in the lack of evidence as to the presence of vertical plates in the former the author is indisposed to admit the generic identity of the Old World and American types.

Dipterocarpus tuberculatus, known locally as the In tree, one of the most important members of the family Dipterocarpaceæ which bulks largely in the Burmese forests, forms the subject of a Forest Pamphlet (No. 13) compiled by Mr. R. S. Troup, and published by the Government of India. As a rule, it is a dominant tree, and an idea of its characteristic gregariousness may be obtained from computations, which estimate fifteen to twenty good-sized trees per acre. Fine specimens attain a height of 90 feet, with a clean bole of 60 feet and a girth of 10 feet. The wood is resinous and heavy, requiring bamboos if it has to be rafted; it is in considerable demand, as it works well, but is not durable if exposed.

A RECENT paper by Prof. G. Klebs, published in the *Sitzungsberichte der Heidelberger Akademie der Wissenschaften* (part v., 1909), and obtainable as a separate brochure, describes the modifications produced in flowers of *Sempervivum* when exposed to special cultural conditions, and incidentally contains some pertinent opinions on the subjects of variation in plants and inherited characters. The species, *S. acuminatum*, chosen for experiment is a recognised natural species. Plants were grown in rich soil and kept at a high temperature. The first inflorescences were cut off when quite young, and dormant inflorescences showing abnormalities were developed, from which self-fertilised seed was collected. Plants raised from the seed were grown, and increased vegetatively for three years. On flowering, the terminal inflorescences were removed as before, and the later flowers produced abnormalities, some new, others similar to those obtained before. These abnormal characters the author recognises as pathological modifications, yet regards their origin as intermediate between fluctuating variations and mutations.

MR. T. PERCH is responsible for three recent Circulars (vol. iv., Nos. 21-3) dealing with fungus diseases, issued from the Royal Botanic Gardens, Ceylon. A bark disease of *Hevea* and tea that appears during the south-west monsoon is attributed to *Corticium javanicum*. A more insidious disease of *Hevea*, known as "die-back," is started by a *Gloeosporium* which paves the way for the destructive parasite, assigned to the genus *Easiodiplodia*. The third pamphlet discusses very fully the

stem-bleeding disease of the cocoa-nut caused by *Thielaviopsis aceticus*, a known parasite on sugar-cane in Java. The author communicates a number of details regarding the structure of the cocoa-nut palm. He distinguishes two types of tree, the one with a uniform columnar base, the other with a swollen base, and suggests that the latter, which is the less desirable, has been selected unconsciously by planters.

ACCORDING to the *Agricultural Journal of the Cape of Good Hope*, a certain amount of work on the hybridisation of wheat is being done in Cape Colony. At present less than half the wheat required for consumption is grown, the rest being imported; steps are therefore being taken to increase the area under crop. One of the chief difficulties about wheat-growing in the colony, and particularly in the western provinces, is the vast amount of destruction caused by rust; indeed, this was at one time so serious that farmers almost despaired of making wheat-growing a success. The importation of certain varieties more or less resistant to rust rather relieved matters, but none has yet been found fully to meet the local requirements. A cross between Gluyas and Darling promises to give useful results; Gluyas is resistant to rust but possesses very weak straw; Darling, on the other hand, possesses exceptionally strong straw. A hybrid, Union, has been picked out possessing strong straw and also resistant to rust. Another promising cross is between Gluyas and Du Toits, probably the finest milling wheat in the colony.

IN the *Sitzungsberichte* of the Vienna Academy of Sciences (Bd. cxviii., Heft vii.) P. Vujević discusses at some length the results of five years' temperature observations (1902-6) made at Belgrade. The readings were taken from freely exposed mercury thermometers, with cylindrical bulbs, at the earth's surface and at 0.4, 1.0, and 2.0 m. above it. The results are of special interest in view of the plea for such observations recently put forward in this country. The excess of the mean temperature from hourly readings of the freely exposed thermometer at 2 m. above the mean temperature in the screen at the same height is -0.1° C. in January, $+0.6^{\circ}$ in July. The mean difference is greatest ($+2.0^{\circ}$ C.) at 1 p.m. and least (-1.0° C.) at 8 p.m., in both cases in July. The occurrence of the minimum difference immediately after sunset is attributed to the retention of warm air in the screen. It is probably also due in part to the heat capacity of the screen itself. The point is of importance in connection with the analysis of the daily variation of temperature. Comparisons showed that the freely exposed thermometers gave higher readings at all levels on clear days, and lower readings on a cloudy day, than the aspirated thermometer of the Assmann instrument. The disturbance of the natural condition by the artificial aspiration would have some influence on these results. The observations from the freely exposed instruments are compared with one another without any attempt at correction. Throughout the year the temperature at the earth's surface is lower by night and higher near mid-day than that in the air. The extreme differences between the hourly means for surface and air are approximately $+1.5^{\circ}$, -0.5° C. in January, $+9.1^{\circ}$, -1.6° C. in April, and $+15.2^{\circ}$, -1.0° C. in July. Deposition of dew diminishes the value of the negative difference, while clear weather increases both the positive and negative differences. The temperature on the exposed earth's surface was found to be considerably below that of the neighbouring upper surface of snow. It is assumed that the results are inter-comparable because the thermometers are similar, an assumption which is not justified unless the ventilation is the same for each; this

is probably not the case. No attempt is made to find the effect of varying natural ventilation.

MR. HERMANN GEWECKE sends us a dissertation on the influence of changes of internal structure on the physical properties of copper, electrical conductivity and density being the properties chiefly considered. In this pamphlet of ninety-three pages the author discusses at length the experimental results and theoretical conclusions of previous workers in the same field, and also describes his own measurements of electrical conductivity and determinations of density carried out on a series of copper wires drawn under known conditions. His results show that the effects of wire-drawing depend upon two actions, which occur simultaneously, but to a different relative extent when the circumstances of the drawing process are altered. These two actions are longitudinal extension and lateral compression, and their effects on conductivity and density are opposite in character. The net result is that, as wires become more severely hard-drawn, their density first increases and then decreases again, while the electrical conductivity is reduced—in some cases to an extent exceeding 1·5 per cent. Mr. Gewecke has also studied the annealing process in these wires, but although a temperature of 210° C. is found to mark the beginning of rapid annealing, this temperature is found to vary with the duration of heating. This supports the view of Turner and Levy that the change in the copper is rather of the nature of a continuous re-arrangement of structure than a transformation from one allotropic phase into another, as suggested by Dr. Beilby.

WE have before us a draft report of the science standing committee of the Concrete Institute relative to a proposed standard algebraical notation for formulæ and calculations employed with reference to reinforced concrete. It would appear that this was considered last September at Copenhagen by a committee of the International Commission on Reinforced Concrete (established by the International Association for Testing Materials), which approved of a three-alphabet system, the three alphabets employed to be Roman capital letters, Roman small letters, and Greek smalls. The principle of the initial letter is also adopted in the report, though this cannot be made a basis for agreement with Continental nations; it is held, no doubt rightly, that the use of a self-explanatory notation is in this matter more important than international uniformity. The use of Latin smalls for linear dimensions, intensities of forces, &c., and constants, Latin capitals for areas and volumes, and total forces, Greek smalls for angles and constants, is recommended. The notation can be extended by the use of subscript letters; thus B_c may be used for "bending moment at the centre of a beam." The scheme is not put forward as part of a comprehensive system; indeed, it is pointed out that letters fail if any attempt is made at a comprehensive system for engineering formulæ alone, not to speak of physics generally. It is, however, clearly desirable that some general plan should be agreed upon, by engineers at least, before an attempt is made to work out a detailed notation for each branch of engineering work. It may be that the only plan possible is the adoption of some general principles, and those suggested are sufficiently in accord with existing usage. Possibly the Engineering Standards Committee may be able to look into the matter.

A PAPER on compounding and superheating in Horwich locomotives was read at the Institution of Mechanical Engineers on March 7 by Mr. George Hughes, the chief mechanical engineer of the Lancashire and Yorkshire Railway. A number of comparative tests have been made by

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the author on compound and simple engines, leading to the conclusion that the compound engine is more economical and efficient than the simple. The compound engine developed a comparatively greater pull on the draw-bar for the same indicated horse-power. The Aintree to Accrington trials show an economy of 23 per cent., and the Goole to Smithy Bridge tests an economy of 22·5 per cent., in favour of the compound, based on the steam consumption per indicated horse-power. On the basis of total steam consumption per hour, the savings in these trials are 39·7 and 33·3 per cent. respectively. In fuel consumption the savings by the compound per indicated horse-power per hour are 16 per cent. and 8·3 per cent. respectively. As the horse-powers developed by the compound are less than for the simple engine, the total fuel savings are 36 per cent. and 23·7 per cent. respectively. Using Schmidt's system of superheating on a six-wheeled coupled goods engine, comparative trials show an economy in coal of 12·93 per cent. per ton-mile for the superheater. Tests on five passenger engines having Schmidt's superheaters, extending over some months, show a coal saving of 21·4 and 21·9 per cent. per ton-mile, computed from the drivers' and guards' returns. Mr. Hughes is to be congratulated on his success in dealing with very difficult problems when applied to locomotives.

AN improved form of mouth blow-pipe is submitted for inspection by Messrs. W. and J. George, Ltd., Great Charles Street, Birmingham. It is a burner and air-tube combined, connecting directly with the gas supply by means of rubber tubing, and dispensing with a Bunsen burner. A metal collar at the mouth-piece end keeps the latter clean by preventing it from coming into contact with the bench when laid down. A similar collar at the burner end keeps the flame from scorching the wood. If desired, the instrument can be clamped to a retort stand for use at any convenient height or angle, and it serves instead of a foot blow-pipe for many small operations, such as flame, charcoal, and "bead" tests, and light glass-blowing. The article is neatly and strongly constructed, and for convenience of renewal the several parts are made to a standard size.

THE January number of the *Bulletin de la Société d'Encouragement pour l'Industrie nationale* contains two reports by A. Moreau on two forms of road-tarring apparatus, due to MM. J. Lassailly and J. Vinsonneau respectively. The tar has to be extracted from the barrels, warmed to a temperature sufficient to reduce its viscosity and remove water, and applied to the road as uniformly and as rapidly as possible. In the first apparatus of M. J. Lassailly all these operations are carried out by steam, and require a minimum of skilled control. The Vinsonneau apparatus warms the tar to 80° C. by a thermosiphon heated by a petrol burner, and distributes it by means of compressed air. The cost of superficial tarring by either process is from 8 to 10 centimes per square metre treated.

A SECOND revised edition of the valuable little book on "Butter-making on the Farm," by Mr. C. W. Walker-Tisdale and Mr. T. R. Robinson, has just been issued by the publisher, Mr. J. North, Office of the *Dairy World and British Dairy Farmer*. The original work was favourably reviewed in NATURE of February 12, 1903, and the revised edition should secure for it many new readers. The subject-matter has been brought up-to-date by revision and additions. The price of the book remains 1s. net.

ERRATUM.—March 24, p. 104, col. 1, line 36, for "9 grams" read "6 grams."